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A NOTE ON THE TAXONOMY AND CYTOLOGY OF *PYRROSIA NUMMULARIFOLIA* (SW.) CHING AND *PYRROSIA OBOVATA* (BL.) CHING

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ABSTRACT

The discovery of great range of morphological intergrades between the orbicular sterile fronds of very carnose texture with cordate or rounded base on stipes 1-2 mm. long, characteristic of *Pyrrosia nummularifolia* (Sw.) Ching and obovate or spathulate fronds of carnosopapyraceous texture with cuneate base on stipes 1-2 cm. long as assigned to *Pyrrosia obovata* (Bl.) Ching, suggests that *P. obovata* should be merged in *P. nummularifolia* on the basis of the rule of priority and there is no justification whatsoever to assign the former even the status of a variety or forma of the latter species.

The cytological findings of $n = 37$ and $2n = 74$ in *Pyrrosia nummularifolia* (Sw.) Ching from the Khasi Hills conform to one of the two basic chromosome numbers $x = 36$ and 37 discovered so far within the genus *Pyrrosia*.

INTRODUCTION

Pyrrosia nummularifolia (Sw.) Ching is a distinct species within the large genus *Pyrrosia* of the family Polypodiaceae (*sensu stricto*). It is distinguished from other species by distinct dimorphic fronds which are also the smallest in size amongst the other Indian species of the genus. It was first described as *Acrostichum nummularifolium* Sw. (Syn. 191. 1806), but was treated under the genera *Niphobolus* (J. Sm. JoB 3:396. 1841), *Galeoglossa* (Pr. Epim. Bot. 133. 1849), *Polypodium* (Mett. Pol. 123n. 1857) and *Cyclophorus* (C. Chr. Ind. 200. 1905) from time to time, before finally being treated under *Pyrrosia* by Ching (1935). Similarly, an allied species, *Acrostichum obovatum* Bl. (Enum. 102, 1828), described from Java, was also treated under the genera *Niphobolus* (Kze. Bot. Zeit. 120. 1848), *Galeoglossa* (Pr. Epim. Bot. 133. 1849), *Polypodium* (Mett. Pol. 124n. 1857) and *Cyclophorus* (v. A. v. R. Mal. Ferns 685. 1909) from time to time. But both Clarke (1880) and Christensen (1905) treated *A. obovatum* Bl. as a variety of *Polypodium nummularifolium* Mett. and *Cyclophorus nummularifolius* (Sw.) C. Chr., respectively, although later, Christensen (1934) accepted v. A. v. R.'s (l.c.) treatment of its distinct specific status. Ching (1935) also recognised it as a distinct species and treated it as *Pyrrosia obovata* (Bl.) Ching. Ching (l.c.) however, considers *P. obovata* (Bl.) Ching as intimately related to *P. nummularifolia* (Sw.) Ching, the two species differing in the shape, texture and stipitate nature of the sterile fronds only. He assigned "orbicular sterile fronds with cordate or rounded base on stipes 1-2 mm. long and very carnose texture" to *P. nummularifolia* and "obovate or spathulate sterile fronds with cuneate base on stipes 1-2 cm. long and carnosopapyraceous texture" to *P. obovata*.

TAXONOMY

Bearing in mind the key differences characterising the two species, the herbarium specimens of *Pyrrosia nummularifolia* (Sw.) Ching available in three Indian herbaria namely the Reginal Herbarium of Botanical Survey of India at Shillong, Central National Herbarium, Sibpore (West Bengal) and Herbarium of the Forest Research Institute, Dehra Dun, were carefully studied. It appeared that the Indian specimens have generally been identified to *nummularifolium* Sw., although a few specimens named as *Polypodium nummularifolium* Mett. var. *obovatum* Clarke are at times included in the *nummularifolium* bundle.

Again, *Pyrrosia nummularifolia* (Sw.) Ching has also been studied in its natural habitat and is seen growing gregariously on the host plant with its wiry wide-creeping rhizome. It almost covers all the branches, twigs and even the leaves of very big trees like *Ficus benghalensis* etc. and is supposed to be one of the agents in causing epiphytosis in the host plant (cf. Ruinen 1953).

The survey of both herbarium and living materials shows that the fronds are distinctly dimorphic, the sterile fronds being much shorter and broader than the fertile ones. These sterile fronds, however, show a great range of variation between the completely orbicular shape, rounded or cordate sessile base and fleshy texture typical of *P. nummularifolia* [see specimens viz. *Nath 13268 from* Nunai (Assam), *Panigrahi* 14809 from Nignu (Tirap F. D.), *Panigrahi* 14810 from Niusa (Tirap F. D.) and *Rolla* 20192 from Namchek (Tirap F. D.) of the Regional Herbarium, Shillong] to spathulate or obovate shape, cuneate base, long stipes and thin papyraceous texture characteristic of *P. obovata* with all types of intergrading forms between these two extremities [see specimens viz. *Panigrahi* 11460 from Ranga R. F. (Assam), *Panigrahi* 16753 from Niusa (Tirap F. D.) and *Panigrahi* 18744 from Dihing R. F. (Assam) of the Regional Herbarium, Shillong]. The specimen represented by *Panigrahi* 15153 from Bhairabkunda (Kameng F. D.) shows interesting features in combining the long stipitate and distinctly obovate sterile fronds characteristic of *P. obovata* with the fleshy and leathery texture characteristic of *P. nummularifolia.* In contrast, the specimen represented by *Rolla* 9071 from Katakhal R. F. (Assam) exhibits almost sessile sterile fronds characteristic of *P. nummularifolia* and thin papyraceous texture of *P. obovata.* The fertile fronds which are much longer and narrower, exhibit far less variation in the length, breadth, shape and texture of the lamina. Certain fertile fronds however, were observed to be quite flat and thin in texture with very sparse distribution of stellate hairs on the undersurface. Certain other fertile fronds are as obovate or spathulate as the sterile fronds with a few sori in the apical part.

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Similar types of situations are also met with while studying the specimens available both at Central National Herbarium, Sibpore (West Bengal) and the Herbarium of Forest Research Institute, Dehra Dun where comparatively larger number of specimens are preserved. The details of one herbarium sheet J. D. H. & T. T. 70 from the Khasi Hills (2000 ft.) deposited at the Central National Herbarium, Sibpore (Fig. 1) may serve as illustration. The sheet contains three separate specimens (A-C), one (viz. A) representing the sterile fronds characteristic of *nummularifolia,* the second (viz. B) possessing the sterile fronds as assigned to *obovata* whereas the third (viz. C) shows all types of sterile fronds between the two extremities on the same rhizome. The rhizome is 32 cm. in length and bears 9 fronds, 2 fertile (f_1-f_2), 6 sterile (s_1-s_6) and 1 ill-developed frond (x). The details of these six sterile fronds are given below (Table 1).

TABLE 1

No. of the sterile frond	Length of the stipe in mm.	Length of the lamina in mm.	Nature of the lamina	Remarks
S_1	8	21	oblong, cuneate at base	nearly conforming to *obovata* type.
S_2	10	30	-do-	-do-
S_3	12	26	obovate, cuneate at base	conforming to *obovata* type.
S_4	3	15	shortly elliptic, rounded at base.	intermediate type.
S_5	1	12	sub-orbicular, cordate at base.	conforming to *nummularifolia* type.
S_6	7	23	elliptic, nearly rounded at base.	nearly conforming to *obovata* type.

Thus, within the length of 32 cm. of a single rhizome great variations both in shape and size of the lamina and length of the stipe of the sterile fronds are met with. This analysis is also in accordance with the observations of Hooker (1863) and Clarke (1880).

Hooker (1863, vol. 5 p. 54) while describing the two species *P.* (= *Niphobolus*) *nummularifolium* Metten. and *P.* (=*Niphobolus*) *obovatum* Metten. quotes verbatim the original description of Mettenius (l.c.) for *P.* (=*Niphobolus obovatum* Met. ten. and cites the locality of this species "Hab. Java, Blume Zollinger" and remarks "This species is unknown to me but some of my specimens of *P. nummularifolium* seem indistinguishable from it; the stipites vary much in length". Clarke (1880) while enumerating the ferns of Northern India, cites khasia as the locality for *Polypodium nummularifolium* Mett. var. *obovatum* (sp.) Mett. and remarks "... There is no authentic example at Kew of Blume's *Acrostichum obovatum* but some khasi examples agree perfectly with Blume's picture; and other khasi examples show in their lower creeping part of the rhizome the barren pinnae sessile round, while in the pendant parts of the same rhizome there are barren and fertile fronds mixed, the barren long obovate on stipes ½—¾ in." It appears, Ching was presumably unaware of the remarks of Hooker (l.c.) and Clarke (l.c.) while proposing the new combination of *Pyrrosia obovata* (Bl.) Ching.

It may, therefore, be concluded that the two species *Pyrrosia nummularifolia* (Sw.) Ching and *Pyrrosia obovata* (Bl.) Ching are founded on inconstant and greatly variable differences in the nature of the sterile fronds and therefore, should not be maintained as two separate species. The discovery of morphological intergrades between typical sterile fronds borne on the same rhizome as in J. D. H. & T. T. No. 70 discussed above, may further indicate that *Acrostichum obovatum* Bl. (1828) cannot even be treated as a variety or forma of *Acrostichum nummularifolium* Sw. (1806) and therefore should be merged with the latter.

CYTOLOGY

The plants of *Pyrrosia nummularifolia* collected from the Khasi Hills kept in cultivation along with the branches of the host plant, thrived well under the shade in the departmental garden at Shillong (5000′). Some plants cultivated in the earthenware pots containing humus and leaf mould produced very few fertile fronds quite late in the season. But these potted plants yielded good number of young roots which were utilised for mitotic studies.

Sori were fixed in Acetic Alcohol (1 : 2), kept over

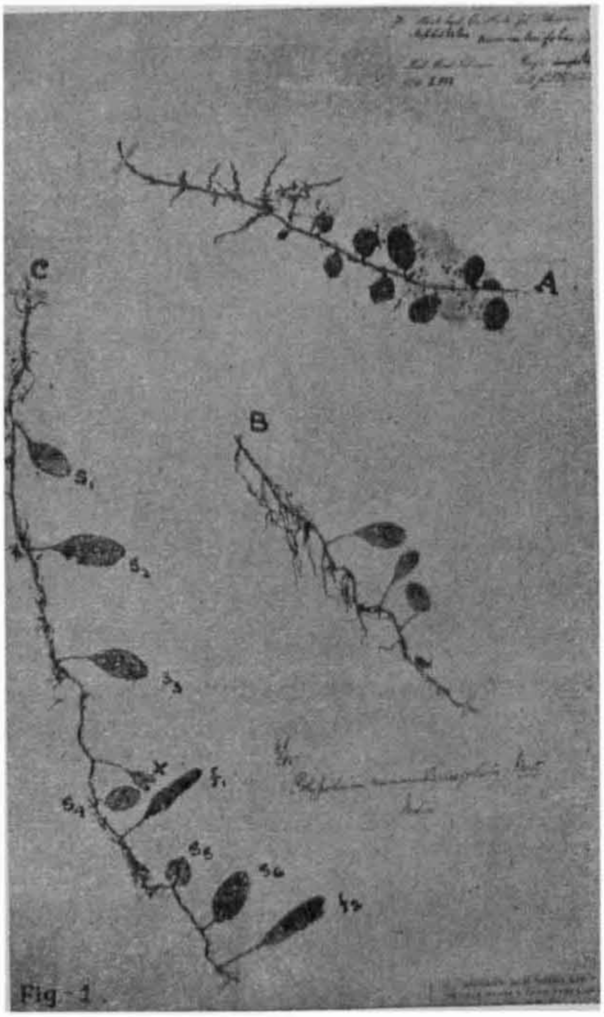

Fig-1

Fig. 1. Habit of the plants of *Pyrrosia nummularifolia* (Sw.) Ching ×⅓.

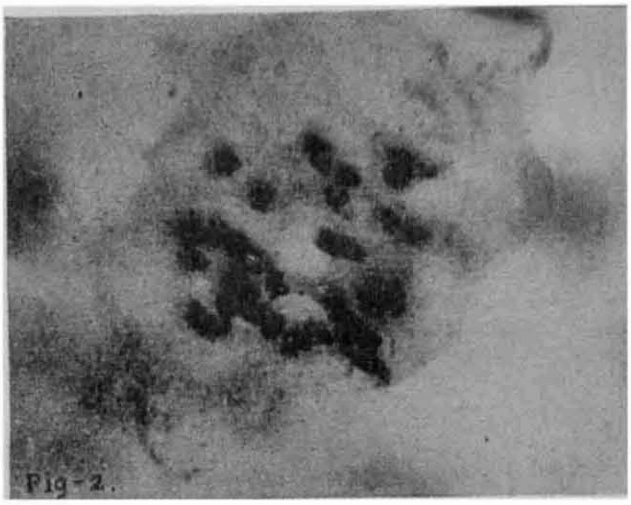

Fig-2.

Fig. 2. Meiosis of *P. nummularifolia* n = 37 × 800.

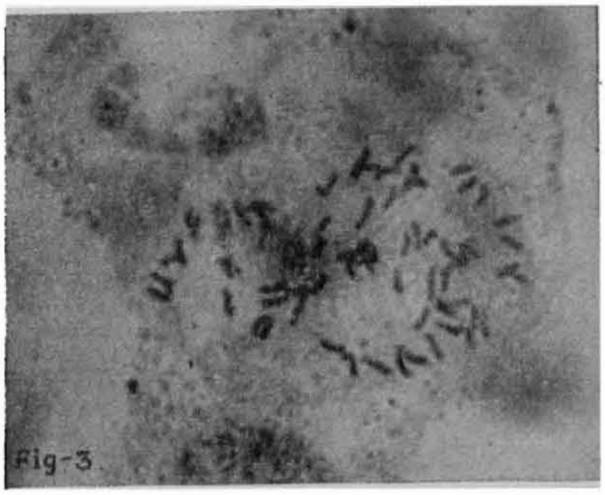

Fig-3.

Fig. 3. Mitosis of *P. nummularifolia* 2n = 74 × 800.

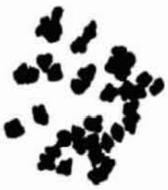

Fig-4.

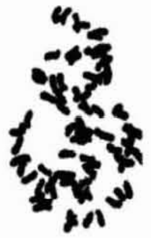

Fig-5

Fig. 4. Explanatory diagram of Fig. 2 × 480.
Fig. 5. Explanatory diagram of Fig. 3 × 480.

night and smeared in Aceto-carmine. Root tips were pretreated with saturated solution of 8-hydroxy quinoline for 3 hours, and fixed in Acetic Alcohol (1 : 2). The fixed root tips were hydrolysed in 10% Hcl. for 5-10 mins. and smeared in Aceto-carmine. Photomicrographs were taken from temporarily sealed slides which were made permanent by separating the slides and coverslips in pure tertiary Butyl Alcohol, passing through gradations of Butyl-Alcohol and Xylol mixtures (viz. Butyl Alcohol : Xylol = 1 : 1-5 mins., Butyl Alcohol : Xylol = 1 : 3-5 mins., Butyl Alcohol : Xylol = 1 : 9-5 mins., Xylol—a dip) and finally, mounting with canada balsam.

The meiotic counts revealed 37 bivalents per spore mother cell at diakinesis (Figs. 2 & 4). The mitotic counts from the root tips showed 74 chromosomes per cell at metaphase (Figs. 3 & 5). This, therefore, conforms to the basic chromosome conforming to the base number $x=37$ discovered in few species of *Pyrrosia* viz. *P. mannii* (Gies.) Ching, *P. subfurfuracea* (Hook.) Ching (cf. Panigrahi and Patnaik 1961, Malhotra in Mehra 1961 and *P. gardneri* (Mett.) Sledge, *P. stigmosa* (Sw.) Ching (cf. Manton and Sledge 1954, Manton 1954 and Malhotra in Mehra *loc. cit.*) and *P. mollis* (Patnaik in and Panigrahi 1963). The discovery of $n=108\text{-}111$ in *P. acrostichoides* (Forst.) Ching (cf. Manton and Sledge 1954), $2n=216$ in *P. adnascens* (Sw.) Ching (cf. Abraham, 1961) and $n=36$ in *P. flocculosa* (Don) Ching (cf. Panigrahi and Patnaik, l.c.) shows, however, the existence of another basic chromosome number $x=36$ within the genus.

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